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APPLICABILITY OF SKYLAB
REMOTE SENSING FOR DETECTION AND
MONITORING OF SURFACE MINING ACTIVITIES

SKYLAB EREP INVESTIGATION 9669

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1.0 INTRODUCTION

The objective of this investigation is to evaluate EREP imagery as a means of detecting and monitoring strip mines, their environmental effects, and reclamation activities. EREP S-190A and S-190B imagery of a calibration test area will be analyzed, and some S-192 thermal imagery during a night time pass is desired in hopes of detecting acid waste waters whose temperatures might exceed those of the surrounding environment.

Initially, the investigation will consist of a census of active and inactive strip mines along with estimates of disturbed and reclaimed acreage. Notable damage to the environment will also be included.

Because of weather conditions and cloud cover during Skylab overflights, the primary test site has been changed as of October 14, 1974, to encompass portions of Kentucky and Tennessee, extending from latitude $36^{\circ}00'N$ to $37^{\circ}30'N$ and longitude $86^{\circ}00'W$ to $88^{\circ}30'W$.

2.0 PROGRESS

2.1 Visitation to Surface Mining Activities In Tennessee and Kentucky

During the period of October Mr. R. Brooks and Mr. J.D. Pennewell visited surface mining activities in the Nashville, Tennessee and Madisonville, Kentucky areas. Both large scale coal mining activities and vast areas of reclaimed lands are evident in the Kentucky region. Reclaimed areas encompass newly established vegetative covers which contain plants of varying vigor and distribution. Older areas which were not reseeded because of lack of reclamation legislation have reestablished via natural seeding. It became evident from surface observations that specific spatial and spectral properties existed between the two areas [i.e. reseeded areas are uniform in plant species whereas natural reestablishment contains a hodge-podge of plant formations] and these properties should be evident on Skylab data films. Spoil areas, open pits, and sludge piles are of sufficient size to be detected on Skylab photography to provide accurate orientation and measurements.

Surface mining activities in the Tennessee area were confined mainly to limestone, phosphate, and clay operations. These operations are quite dissimilar to those of coal operations. Limestone quarries do not encompass the vast areas contributed by surface coal mining; however, the operations usually are much deeper below ground surface and many times strike subsurface springs that produce lakes or excessive water ponding. Phosphate mining operations south of Nashville provide exposed soils of reddish brown hue and are signified by large mounds of back filling. These mining activities should be easily separated from limestone quarries on remotely sensed film which are white-gray in color and coal operations which are relatively black in color. Operative methods of limestone and phosphate should not have excessive spoil areas; whereas, coal

operations will have spoil deposits, slag, and wash waste materials deposited in large areas.

2.2 Visitation with Kentucky and Tennessee State Personnel

Mr. Downing of Kentucky State provided us with background information on mining activities prior to legislative action requiring reclamation and modern requirements after enactment of legislation. Mr. Downing and his office made available transportation to various mining activities depicting a wide spectra of surface depletion activities, reclamation, and previous insults to the environment by mining operations. It is apparent that enacted legislation is aiding in minimizing continuing abuse to mined lands.

Mr. Higgins of Tennessee State provided important information and transportation to various mining activities around the Nashville area. It also became apparent that positive action was being taken by the state to minimize serious abuse to the environment and landforms that might endanger future rehabilitation of the land or adjacent areas.

2.3 Ground Observations of Surface Water Streams and Lakes

In general mining companies are diligent about maintaining good water quality from their operations. Excessive sedimentation is trapped and held in holding ponds and basins in order to allow particulate materials materials to filter out. Careful concern is given to the regular testing of water quality to monitor pH, sedimentation, Ca and Fe ions. Samples are taken daily by the companies and unannounced checks are made by state agencies. Variations in readings are subjected to serious investigations. Environmental abuses causing excessive pH changes or drainage of unacceptable limits of Fe or Ca ions are subject to corrective

action. If correction is not attempted within the mining operation then the entire operation is subject to fine and/or stoppage.

2.4 Extraction of Features from film data and orientation of data to known geographic features.

Five frames of Imagery from Skylab 3 and 4 have been selected in the Kentucky and Tennessee Test Site area. The mining and reclamation areas are being analyzed to orient the areas with respect to known geographic locations. Spectral values of reclaimed areas are being investigated to ascertain if they match with those qualities observed during ground observations.

3.0 PROBLEMS

No significant problems have occurred during this period.

4.0 PLANS

4.1 Efforts are in progress to place the SL-3 & 4 imagery on Rear Projection Readers and obtain 36x enlargements that can be used to; (1) accurately locate the areas in question, (2) delineate accurate boundaries between various reclaimed areas and mining operations, (3) determine spectral qualities of various types and ages of reclaimed vegetative canopies.

This information will be extracted from the data film and utilized to generate data displays and products that can be utilized by local resource management personnel and agencies.